

Remarks

Claims 2, 3 and 5-33 are now pending in this application. Applicants have not amended the claims. Applicants respectfully request favorable reconsideration of this application.

The Examiner rejects claims 2, 3 and 5-33 under 35 U.S.C. § 103(a) as being unpatentable over U.S. patent 5,378,827 to Keunecke et al. in view of EP 402 606 to Rahman et al. or U.S. patent 2,134,825 to Hill et al.

The combination of Keunecke et al., Rahman et al. and Hill does not suggest the present invention as recited in claim 33 since, among other things, none of these references suggests a method for producing cellulose carbamate that takes place in the conditions recited in claim 33. For example, at col. 5, lines 19-32, Keunecke et al. suggests a reaction that takes place in suspension in organic carrier liquid with simultaneous boiling. According to the examples, the amount of toluene, xylene or Decalin (organic carrier liquid) is over 10-fold in comparison to cellulose. Prior to the reaction, the cellulose is first mixed with a urea solution, whereafter the excess urea solution is pressed off in a screw extruder, as described at col. 4, lines 64 to 68. The purpose of this step is to provide sufficient amount of urea for the reaction and to distribute urea uniformly in the cellulose, as described at col. 2, lines 48-52.

The Examiner cites the sentence bridging pages 3 and 4 of Keunecke et al. as disclosing that, "in step (d-2), preferably the aqueous urea solution is added in such an amount that the weight ratio of the total liquid phase to the solid cellulose carbamate in the remaining reaction

product is in the range of 20 to 40." The sentence relates to the weight ratio, which is a value that is different from a percent content. Along these lines, weight ratio is the direct result of dividing mass A by mass B. In this case, the total liquid phase is thus 20 to 40 fold. Keunecke et al. describes step d-2 at col. 5, lines 59-63 as, "Solids consisting of cellulose carbamate, excess urea and adhering reaction carrier are removed from the filter and transferred via conduit 32 to a mix tank 33, in which the cake is suspended with urea solution supplied through conduit 34". In this context, "suspended" means that there must be liquid many times the amount of solids. If the amount of liquid were only 20 to 40 %, the suspension would be impossible.

Further, at col. 6, lines 46-49, in describing Example 1, Keunecke et al. states, "There result 10.4 kg/h of filter cake comprising 30% cellulose carbamate, 20% urea and 50% toluene. The filter cake is suspended in 96.7 kg/h aqueous urea solution at 85° C". By a simple calculation, 30% of 10.4 kg is about 3.1 kg, which is the amount of solid cellulose carbamate per hour, and, if the urea solution is taken as the "total liquid phase", it will be 96.7 kg per hour. The ratio of the total liquid phase to solid cellulose carbamate is about 32, that is, the amount of liquid phase is 32-fold to the solid cellulose carbamate.

Moreover, the ratios referred to above are based on cellulose carbamate, which is the final product of the reaction. The values recited in claim 33 and dependent claims concern cellulose, which is unreacted starting material for making the cellulose carbamate. Therefore, the values suggested by Keunecke et al. are not related to the values recited in claim 33 because they concern a totally different process stage and different substances.

The Examiner asserts on page 3, second last paragraph of the office action that, "The Keunecke et al. patent further discloses the use of a screw extruder to carry out the process thereof, which embraces mechanical working of the reaction mixture recited in the instant claims since the instant specification at page 4, lines 30-33, discloses the mechanical working device may be an extruder." Keunecke et al. suggests utilizing the screw extruder for pressing the excess urea solution off from a suspension of cellulose and urea solution, as described in the paragraph bridging cols. 4 and 5. The screw extruder is not intended for bringing out a reaction between urea and cellulose, and there is no allusion to this purpose in Keunecke et al. The reaction is conducted in a series of four stirring reactors 17a-17d, as described at col., lines 23 to 26, as follows: "The suspension then flows in a cascade through four successive stirring reactors 17a-17d, in which the reaction mixture remains several hours for conversion".

On the other hand, at page 4, lines 30-33, in the instant specification describes the extruder in connection with the method as follows: "The processing device is a mechanical working device, in which the mixture is compressed, rubbed and stretched several times. In particular, the working device may be a sieve press, a continuously operating roll mixer, or an extruder." The word "extruder" is taken out of context and compared with a term "screw extruder" which Keunecke et al. suggests utilizing in a different way and for a different purpose.

Neither Rahman et al. nor Hill overcomes the above-described deficiencies of Keunecke et al. Along these lines, neither Rahman et al. nor Hill suggests subjecting a mixture including cellulose, a liquid, auxiliary agent, and urea, where the liquid content in the mixture is less than 40 % to mechanical working. Rahman et al. does not suggest a liquid content under 40 % in

those phases of the process where the mixture is agitated for thoroughly contacting cellulose with the auxiliary agent and urea. Rather, Rahman et al. suggests process phases, which might be considered similar to carry out the contact among mixture components, where the mixture exists as a slurry. Rahman et al. describes this at col. 9, lines 11-13, for example. Every example of Rahman et al. suggests stirring or agitating phases where the urea-containing mixture is slurry. If such phases were considered to correspond to the phase of mechanical working of a mixture according to the present invention, they are being carried out on a mixture having a totally different consistency than the present invention as recited in claim 33, which includes less than 40 % liquid content. With a slurry as suggested by Rahman et al., it is impossible to obtain the advantageous effects described in the present application at page 3, line 35, through page 4, line 2. A slurry as suggested by Rahman et al. is not in a physical entity that could be compressed, rubbed and stretched a plurality of times.

Rahman et al. suggests a mixture having a low liquid content only when the mixture is in a static state. That is, Rahman et al. only suggests a mixture having a low liquid content in situations where excess liquid has been drained off or pressed out and the mixture is left to stand, possibly under the influence of heat. While in that state, the mixture is not compressed, rubbed and stretched several times. There is no teaching, suggestion or motivation to replace a conventional stirring or agitating phase of a high liquid content slurry with a mechanical working phase of a mixture having a liquid content of less than 40 % in a part of a process where excess liquid has been removed. The removal of excess liquid typically means the termination of the stirring or agitation phase for contacting the cellulose and an auxiliary agent and urea. The liquid content as defined in claim 1 is important in the sense that, as contrasted with known

processes, it brings about the possibility of mechanical working of the mixture in such a consistency that the phenomena described on page 3, line 35, through page 4, line 2, are possible simultaneously.

Furthermore, Rahman et al. suggests a three-phase process that includes an initial step of contacting the cellulose with a sodium hydroxide/urea solution at low temperature, a second step of washing by a urea solution, and a final step of oven treatment at high temperature. Both the initial and second steps are performed when the mixture is slurry. The three-phase process is shown in the examples I to V and VII of Rahman et al. In example VI, the washing step is omitted. In Rahman et al., it is practically impossible to get a liquid content of lower than 40 % mechanically, such as through pressing, filtering or other processes.

On the other hand, according to the present invention as recited in newly presented independent claim 33 the processing takes place in a single step, at low liquid content, and under mechanical working of the low liquid content mixture. In other words, there are not initial and second phases suggested by Rahman et al. According to the present invention as recited in claim 33, the absorption of the auxiliary agent and urea to the cellulose and at least partly the reaction is caused by the mechanical working, not low temperature.

Furthermore, the definition "at least partly performing reaction between the cellulose and urea" is important, since in Rahman et al. the reaction takes place only in an oven. The role of mechanical working, on the other hand, is emphasized in the present application, such as at the paragraph bridging pages 3 and 4; page 4, lines 11 to 13; and page 4, lines 33 to 37.

Hill et al. does not overcome the above-discussed deficiencies of Rahman et al. For example, Hill et al. does not suggest mechanical working of the mixture. Rather, as described at page 2, right hand column, lines 39 to 42, Hill et al. suggests passing the sheeted cellulose through squeeze rolls which press out the excess steeping liquor. This does not suggest mechanical working of the mixture. At the stage where the cellulose is sheeted, the solid components of the mixture exist in the static condition. They are not in a condition where they can be subjected to continuous kneading action or the like as represented by compressing, rubbing and stretching the mixture a plurality of times. First, the cellulose is in sheeted form. Being in sheet form means that the fibers have limited movement with respect to each other. When the sheeted cellulose is passed between the squeeze rolls, it is a once through operation where the fibers only move instantaneously closer to each other while the excess liquid escapes. No phenomena such described at page 3, line 35, through page 4, line 2, of the present application can occur simultaneously because this is mechanical dewatering in one step rather than continuous working. Thus, the procedure of Hill et al. is not to be confused with the working by running the mixture between a nip of two rolls in the present invention, such as shown in Fig. 2, because the fibers are subjected to working repeatedly in this embodiment of the present invention.

In view of the above, the references relied upon in the office action, whether considered alone or in combination, do not suggest patentable features of the claimed invention. Therefore, the references relied upon in the office action, whether considered alone or in combination, do not make the claimed invention obvious. Accordingly, Applicants submit that the claimed

invention is patentable over the cited references and respectfully request withdrawal of the rejection based on the cited references.

If an interview would advance the prosecution of this application, Applicants respectfully urge the Examiner to contact the undersigned at the telephone number listed below.

The undersigned authorizes the Commissioner to charge fee insufficiency and credit overpayment associated with this communication to Deposit Account No. 22-0261.

Respectfully submitted,

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